CLAIMS

1.   A method for operating a mass spectrometer, the method comprising:

a)   generating a test packet of ions from a pulsed ion source;

b)   detecting a population of ions derived from the test packet of ions;

c)   based on the detected population, determining a number of ionization events of the pulsed ion source required to provide an analysis packet of ions expected to have a desired population of ions; and

d)   providing an analysis packet of ions by accumulating ions for the determined number of ionization events.

2.   The method of claim 1, wherein:
steps (a) through (d) are performed in the order recited.

3.   The method of claim 1, wherein:
generating a test packet includes firing a predetermined number of laser shots at an analyte disposed on a sample plate.

4.   The method of claim 3, further comprising:
accumulating the test packet of ions in an ion storage device.

5.   The method of claim 4, wherein:

determining a number of pulsed ionization events based on the detected population includes estimating an accumulated ion charge of the accumulated test packet of ions.

6.   The method of claim 4, wherein:

the ion storage device includes a multipole ion guide.

7.   The method of claim 4, further comprising:

removing substantially all ions derived from the test packet of ions from the ion storage device before accumulating ions for the determined number of ionization events.

8.   The method of claim 3, wherein:

determining a number of ionization events includes determining a number of laser shots required to provide an analysis packet of ions expected to have a desired population of ions; and

generating the analysis packet of ions includes accumulating ions for the determined number of laser shots.

9.   The method of claim 4, further comprising:

transferring at least a portion of the analysis packet of ions to a mass analyzer of the mass spectrometer.

10.   The method of claim 9, wherein:

the mass analyzer includes the ion storage device.

11. The method of claim 1, wherein:

the pulsed ion source is a MALDI ion source.

12. The method of claim 1, wherein:

detecting ions derived from the test packet of ions includes detecting ions in the test packet of ions.

13. The method of claim 1, wherein generating a test packet of ions includes:

generating one or more pulses of ions in the pulsed ion source;

accumulating the ions in the generated pulses of ions; and

generating product ions from the ions accumulated from the generated pulses of ions;

wherein detecting a population of ions derived from the test packet of ions includes detecting at least a portion of the generated product ions.

14. The method of claim 13, wherein:

generating the analysis packet of ions includes generating product ions from the ions accumulated for the determined number of ionization events.

15. The method of claim 1, wherein:

the desired population of ions is defined as a population of ions expected to have a desired behavior in the mass analyzer.

16.   The method of claim 4, wherein:

the desired population of ions is defined as a population of ions expected to have a desired behavior in the ion storage device.

17.   The method of claim 8, wherein:

generating the analysis packet of ions includes accumulating ions for a determined number of laser shots that is less than or equal to the predetermined number of laser shots.

18.   The method of claim 8, wherein:

generating the analysis packet of ions includes accumulating ions for a determined number of laser shots that is greater than the predetermined number of laser shots.

19.   The method of claim 8, wherein:

generating the analysis packet of ions includes generating ions for the determined number of laser shots and accumulating an attenuated amount of the generated ions to provide the analysis packet.

20.   A mass analyzing apparatus, comprising:

a pulsed source of ions;

a detector disposed to receive ions generated by the source of ions;

an ion storage device disposed and configured to receive ions derived from the ions generated by the source of ions;

a programmable processor in communication with the detector and the ion storage device, the processor being operable to:

determine a number of pulsed ionization events required to produce an analysis packet of ions expected to have a desired population of ions;

cause the pulsed source of ions to generate the determined number of pulsed ionization events; and

cause the ion storage device to accumulate substantially all of the analysis packet of ions.

21. The apparatus of claim 20, wherein:

the programmable processor is operable to determine the number of pulsed ionization events based on a detected ion population in a test packet of ions accumulated in the ion storage device.

22. The apparatus of claim 21, wherein:

the programmable processor is operable to determine the number of pulsed ionization events by estimating an accumulated ion charge of the accumulated test packet of ions.

23. The apparatus of claim 21, wherein:

the pulsed source of ions includes a laser; and

the programmable processor is operable to determine the number of ionization events by determining a number of laser shots required to provide an analysis packet of ions expected to have a desired population of ions.

24. The apparatus of claim 20, wherein:

the pulsed source of ions is a MALDI ion source.

25. A computer program product, tangibly embodied on a computer readable medium, for controlling the operation of a mass spectrometer, the product including instructions operable to cause data processing apparatus to perform operations comprising:

causing a pulsed ion source to generate a test packet of ions from a pulsed ion source;

receiving a signal indicative of detecting a population of ions derived from the test packet of ions;

determining, based on the received signal, a number of ionization events of the pulsed ion source required to provide an analysis packet of ions expected to have a desired population of ions;

causing the pulsed ion source to generate ions for the determined number of ionization events; and

causing an ion storage device to accumulate an analysis packet of ions derived from the ions generated for the determined number of ionization events.

26. The computer program product of claim 25, wherein:

the product is operable to cause data processing apparatus to cause the pulsed ion source to generate a test packet by firing a predetermined number of laser shots at an analyte disposed on a sample plate.

27.   The computer program product of claim 26, wherein:
       the product is operable to cause data processing apparatus to cause an ion storage device to accumulate the test packet of ions.

28.   The computer program product of claim 27, wherein:
       the product is operable to cause data processing apparatus to determine a number of pulsed ionization events by estimating an accumulated ion charge of the accumulated test packet of ions.

29.   The computer program product of claim 27, wherein:
       the product is operable to cause data processing apparatus to determine a number of ionization events by determining a number of laser shots required to provide an analysis packet of ions expected to have a desired population of ions; and
       the product is operable to cause data processing apparatus to cause the ion storage device to accumulate ions for the determined number of laser shots to provide the analysis packet.

30.   The computer program product of claim 27, wherein:
       the product is operable to cause data processing apparatus to cause the ion storage device to transfer at least a portion of the analysis packet of ions to a mass analyzer of the mass spectrometer.

31.   The computer program product of claim 30, wherein:
       the mass analyzer includes the ion storage device.

32. The computer program product of claim 25, wherein:
the pulsed ion source is a MALDI ion source.

33. The computer program product of claim 25, wherein causing the pulsed ion source to generate a test packet of ions includes:
causing the pulsed ion source to generate one or more pulses of ions in the pulsed ion source;
causing an ion storage device to accumulate the ions in the generated pulses of ions; and
causing the ion storage device to generate product ions from the ions accumulated from the generated pulses of ions;
wherein detecting a population of ions derived from the test packet of ions includes detecting at least a portion of the generated product ions.

34. The computer program product of claim 33, wherein:
causing the pulsed ion source to generate the analysis packet of ions includes causing the ion storage device to generate product ions from the ions accumulated for the determined number of ionization events.

35. The computer program product of claim 25, wherein:
the desired population of ions is defined as a population of ions expected to have a desired behavior in the mass analyzer.

36. The computer program product of claim 27, wherein:
the desired population of ions is defined as a population of ions expected to have a desired behavior in the ion storage device.

37. The computer program product of claim 29, wherein:
the product is operable to cause data processing apparatus to cause the pulsed ion source to generate the analysis packet by performing a determined number of laser shots that is less than or equal to the predetermined number of laser shots.

38. The computer program product of claim 29, wherein:
the product is operable to cause data processing apparatus to the pulsed ion source to generate the analysis packet by performing a determined number of laser shots that is greater than the predetermined number of laser shots.

39. The computer program product of claim 38, wherein:
the product is operable to cause data processing apparatus to cause the pulsed ion source to generate the analysis packet by performing the determined number of laser shots, and to cause the ion storage device to accumulate an attenuated amount of the generated ions to provide the analysis packet.